

Applicant submits that the instant amendment to claim 7 renders the "construct" and "melting point" rejections moot. As to "the certain" rejection, Applicant points out that "certain sized particles" phraseology is present in the preamble.

Claim 8 is considered vague for its temperature recitation. The instant amendment to claim 8, wherein the temperature is qualified as "heating" temperature, is believed to obviate this rejection.

not mention of pressure
Claim 10 is considered vague for its "inverse relationship" phraseology. The Applicant invites the Examiner to turn to page 16, lines 5-8 of the application whereby the objected to "inverse relation" between applied pressure and temperature is defined. However, to further clarify claim 10, the adjective "applied" is added to claim 10 to obviate the 112 rejection.

Claims 11-12 are considered vague for is "multi-phase" recitation. Independent claim 7 and the subject claims, are herein amended to describe the objects so joined as being solid. Support for said solid recitation is found on page 6, lines 16-17. Applicant submits that the solid recitation obviates the Examiner's "multi-phase" rejection.

Applicant's Invention

The invented method exploits a superplastic deformation process, a salient feature of which is grain boundary sliding. No melting of the constituents of the objects to be joined, nor of any joint compound employed, occurs. The result of this novel process is the production of joint-free, flawless joints having superior strength to that of the solid objects being joined.

Mizuhara/Johns Combination is Impermissible Hindsight

Claims 7-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mizuhara et al (Re.: 35,521) and further in view of Johns (6,168,071) and Chaim et al. Applicant submits that the combination of Mizuhara and Johns is impermissible.

The processes disclosed in Mizuhara and Johns are diametrically opposed. Mizuhara relies on brazing, or melting as defined in Webster's New 20th Century Dictionary, 1963 (pertinent pages attached hereto). All of Mizuhara's examples require

melting to generate a brazing material homogeneously mixed with aluminum to prevent oxidation of the braze during melting.

However, the other reference of the §103 rejection, Johns, avoids melting temperatures. Instead, Johns relies on a diffusion process. Column 2, lines 34-37 of that reference *teaches away from melting*. Indeed, if Mizuhara's melting paradigm was employed in Johns, Johns would not work. Melting confounds Johns' diffusion process.

Alternatively, to relegate Mizuhara to Johns' low temperatures would destroy the objective of Mizuhara. Mizuhara requires melting of brazing alloys to effect formation of a sound joint. All examples recited in Mizuhara recite melting as a discrete step. If the below-melting process of Johns was employed in Mizuhara, Mizuhara's stain-resistant aluminum would not be mixed with its other brazing compound constituents. Indeed, even the instant application (on page 3 lines 20-21) states the drawbacks to brazing and melting. Clause "c" of the instant independent claim assiduously avoids any melting ("heating the joint to a temperature below the melting point of the lowest melting point constituent..."). "If a prior art reference is cited that requires some modification in order to meet the claimed invention and such modification destroys the purpose of the invention disclosed in the reference, one of ordinary skill in the art would not find reason to make the proposed modification." In re Gordon 733 F. 2d 900 (Fed. Cir 1984).

Furthermore, Mizuhara discloses a filler (its braze material). Johns (see Column 1, lines 38-42, lines 29-33) eschews filler. Johns seeks to solve problems associated with using braze or solder. (see Column 1, lines 38-42). Johns will not work when filler is interposed between its very specific silver/copper/germanium alloy structures. Instead, Johns requires very specific preparation of opposing surfaces of objects to be directly joined (Column 3, lines 26-30) including the enhancement of surface area exposure by minimizing gaps between the two objects.

In summary, the nature of the melting process in Mizuhara would defeat the diffusion process recited in Johns. No suggestion exists in either piece of art to combine the two to arrive at the invention as originally claimed. "Obviousness cannot be established by combining the teachings of the prior art to produce the claimed

invention, absent some teaching, suggestion or incentive supporting the combination.”
ACS Hospital Systems Inc., v. Montefiore Hospital, 732 F. 2d 1572.

Assuming *in arguendo* that Mizuhara and Johns are combinable, the resulting product/process would not yield the invented method. The invented method recites a below-melt temperature process *with* filler (joint compound). Johns teaches a below-melt temperature process *without* filler. Mizuhara requires its filler be used in above-melt temperature processes. As such, the two pieces of art teach away from each other while at the same time teaching away from a claimed feature of the instant method.

Notwithstanding the foregoing, Mizuhara is also not applicable for yet another reason. Nowhere in Mizuhara are relative particle sizes mentioned or discussed in the formation of a defect-free ceramic joint. The Examiner's reference to claims 15-17 in Mizuhara discuss *weight percents* only of the construct materials, not particle sizes.

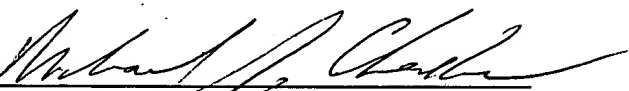
Chaim is the last reference cited in the §103 rejection, for its disclosure of relative thicknesses of interlayer versus particle sizes. In light of the discussion related to Mizuhara and Johns, Applicants submit that Chaim is not relevant.

For the reasons stated above, the §103 rejection based on Mizuhara, Johns and Chaim is obviated. Withdrawal of the rejection and allowance of the subject claims is respectfully solicited.

An earnest attempt has been made hereby to respond to the §103 and §112 rejections contained in the September 24, 2002 Official Action. Applicant submits that the instant amendment places the application in condition for allowance. If the Examiner feels that a telephonic interview will expedite allowance in this matter, he is respectfully urged to contact the undersigned. Reconsideration and allowance of claims 7-13 is respectfully solicited.

Respectfully submitted,

CHERSKOV & FLAYNIK

By 
Michael J. Cherskov (33,664)

Please amend claims 7-8 and 10-12 as follows:

7. (Amended) A method for producing a construct by seamlessly joining solid objects made up of certain sized particles, the method comprising:

- a) supplying a joint compound having particle sizes smaller than the certain sized particles;
- b) applying the joining compound to opposing surfaces of the objects to be joined together;
- c) heating the joint to a heating temperature below the melting point of [the] a lowest melting point constituent of the construct; and
- d) applying pressure to the objects so as to direct the opposing surfaces toward each other [to create a construct], whereby the joint compound is intermediate the opposing surfaces.

8. (Amended) The method as recited in claim 7 wherein the heating temperature is 0.5 to 0.7 the melting temperature of the lowest melting point constituent of the construct.

10. (Amended) The method as recited in claim 7 wherein the applied pressure and heating temperature are applied at an inverse relationship to each other.

11. (Amended) The method as recited in claim 7 wherein the solid objects are comprised of multiphase materials selected from the group consisting of ceramics, glass ceramics, intermetallic compounds, metals, and combinations thereof.

12. (Amended) The method as recited in claim 7 wherein the solid objects are two-phase bodies and wherein the volume percent of one phase to the other phase varies from 2 to 98.

Table 2 shows a representative composition for applying the joint compound by aerosol spraying. This material is applied in 2-20 passes by a spray gun, in which a pressurized gas, such as air or nitrogen, is used to propel ceramic-containing droplets to the surfaces to be joined.

Table 2: Typical aerosol-spraying formulation for joining Al_2O_3 /YSZ ceramics.

Mass (g)	Function	Constituent
20	Powder	50 vol.% Al_2O_3 /50 vol.% YSZ or ZrO_2
50	Solvent	78 wt.% xylene/22 wt.% butanol
12	Binder	Rohm & Haas AT-51 (Philadelphia, PA)
1.5	Plasticizer	Monsanto S-160 (Fayetteville, NC)
0.6	Dispersant	Solsperse S-9000 (Avecia, Manchester, UK)

The resulting sprayed coating is porous and contains organic materials. The organics are removed by heating in an atmosphere that is inert or contains oxygen. The temperature range for organics removal is 150-800°C. The time at maximum temperature is 0.1 to 5 hours. After heating, the joint is assembled, and then the entire construct is then heated to a temperature that is below the melting temperature of the lowest melting temperature component in the construct. Excellent results are obtained when the construct is heated to approximately 50-60 percent of the melting temperature of the lowest melting temperature component. Pore-free, i.e., 100 percent dense joints, are obtained, as depicted in FIG. 2.

The above protocol induces formation of a perfect joint. This result is surprising and unexpected. Prior to the invention, it had not proved to be possible to form pore-free joints from what is essentially a loose pile of powder in the joint. Selection of appropriate ceramic powders (or other hard materials) so that grains do not grow, and for which superplasticity is possible in at least one of the majority phases, proved to be essential for this result.

No preparation of the opposing ceramic surfaces is necessary. The surfaces can be either rough or smooth, or a combination thereof, without effecting the quality of

In re Goretta, et al. (S.N. 09/192,115)
Amendment Transmittal Letter
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Also enclosed herewith is the following:

- A five page Amendment;
- One sheet of Marked-up Claims;
- One sheet of Clean Claims;
- One sheet of Marked-up Specification page;
- One sheet of Clean Specification page;
- Three sheets from Webster's Dictionary;
- Return Postcard, per M.P.E.P. 503.

The Commissioner of Patents and Trademarks is hereby authorized to change any additional fee required under 37 CFR 1.16 and 1.17 or credit any over payments to the PTO Deposit Account of Cherskov and Flaynik number 501709.

Respectfully Submitted,

CHERSKOV & FLAYNIK

BY 
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